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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

PONNALURI, PADMASHRI

ART UNIT

PAPER NUMBER

1639

DATE MAILED: 06/12/2003

28

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/249,529

Applicant(s)

Marks et al

Examiner

Padmashri Ponnaluri

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Mar 31, 2003
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 and 51-57 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 and 51-57 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

- 14) ☒ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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DETAILED ACTION

1. The amendment B, and response filed on 3/31/03 has been fully considered and entered into the application.
2. Claims 1-17 and 51-57 are currently pending and are being examined in this application.
3. This application has been filed with informal drawings. Formal drawings will be required when the application is allowed.
4. Applicant is invited to notice that boxes 5 and 12 were checked by the draftsman. If applicants renumber the figures, applicant is encouraged to amend the specification so that the description of renumbered figures corresponds to the renumbered figures.

The new matter rejections of claims 52 and claims 55-56 has been withdrawn in view of applicants amendment and response.

The rejection of claims 1-17, 51-57 under 35 U. S. C. . 112, second paragraph have been withdrawn in view of amendments to the claims, except that claim as incomplete and omitting essential method steps; and the 'strong wash' as a relative term.

5. The rejection of Claims 1-7, and 12-15 under 35 U.S.C. 102(e) as being anticipated by Larocca et al (US Patent 6,054,312) has been withdrawn in view of the amendments.
6. The rejection of Claims 1-17, 51-54 and 57 under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,054,312 (Larocca et al) in view of either Ewijk et al or Stausbol-Gron et al has been withdrawn in view of amendments to the claims.

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7. The new matter rejection of claim 11 has been maintained for the reasons of record set forth in the previous office action mailed on 9/22/02.

8. Rejection of Claims 1-7, 12-15, and 53 under 35 U.S.C. 102(b) as being anticipated by Barry et al (Nature Medicine, vol. 2, no. 3, March 1996, pages 299-305) has been maintained for the reasons of record set forth in the previous office action mailed on 9/22/02.

9. Rejection of Claims 1-17, 51-54 and 57 under 35 U.S.C. 103(a) as being unpatentable over Barry et al in view of either Ewjik et al or Stausbol-Gron et al has been maintained for the reasons of record set forth in the previous office action mailed on 9/22/02.

New Rejections Necessitated by the Amendment

10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. Claims 1-17 and 51-57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is vague and indefinite by reciting ‘ washing said target cells to remove and eliminate members of said library that are bound to the exterior surface....’ From the claim recitation it is not clear how are phage internalized if all the phage which are bound to the cell surface were removed and eliminated in step ii). Thus no phage would internalize. Does applicants

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mean that the phage which remain bound to the cell surface after certain amount of time or certain reaction conditions, such that only certain phage would internalize into the cell. Applicants are requested to amend the claim.

Claim 1 is vague and indefinite by reciting '... culturing said target cells ...' in step iii) is not clear. Does applicants mean all the target cells are cultured or only certain target cells are cultured.

Claim 1 is vague and indefinite by reciting in step iii) '... culturing said target cells under conditions where members of said phage display library bound to an internalized marker can be internalized.... ...' The recitation of 'can be' is indefinite. And it is not clear whether applicants mean that only the phage bound to the internalizing marker would internalize.

Claim 1 recites the limitation "said phage display library bound to an internalized marker " in step iii). There is insufficient antecedent basis for this limitation in the claim. The claim do not recite phage display library bound to an internalizing marker.

Claim 53 recites the limitation "said removing ". There is insufficient antecedent basis for this limitation in the claim or in claim 1.

Claim 54 recites the limitation "said removing " . There is insufficient antecedent basis for this limitation in the claim or in claim 51.

Claim 55 recites the limitation "said removing " . There is insufficient antecedent basis for this limitation in the claim or in claim 1.

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Claim 56 recites the limitation "said removing " . There is insufficient antecedent basis for this limitation in the claim or in claim 51.

Response to Arguments

12. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

13. Claim 11 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. This is new matter rejection.

The limitation 'wherein step (ii) is performed at about 4° C' claimed in claim 11 has no clear support in the specification and the claims as originally filed. The step (ii) in claim 1 recites removing and eliminating members of said library that are bound to the exterior surface of said target cells with a strong wash. The specification does not disclose the temperature at the wash is conducted to remove the unbound phage. The subject matter claimed in claim 11 changes the scope of the invention as originally disclosed in the specification.

If applicants disagree, applicant should present a detailed analysis as to why the claimed subject matter has clear support in the specification.

14. *Applicant's arguments regarding the new matter rejection of claim 11, filed on 3/31/03 have been fully considered but they are not persuasive.*

Applicants in response to the new matter rejection have pointed out that the specification page 48, lines 16-18, which has support for ice-cold PBS. Applicants arguments have been considered but are not persuasive, since 'ice-cold' does not mean it is 4° C. 'Ice-cold ' is a

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relative term and would include a range of temperatures. The rejection of record would be withdrawn if applicants amend the claim to recite 'ice-cold PBS'.

15. Applicant's arguments regarding rejection of claim 1 (strong wash and as incomplete claim) under 35 U. S. C. . 112, second paragraph, filed on 3/31/03 have been fully considered but they are not persuasive.

A) Applicants arguments regarding 'strong wash' has been considered. Applicants argue that 'one of skill in the art would readily appreciate that a strong wash step capable of removing tightly bound surface phage'. Applicants arguments are not persuasive, because the term 'strong' is a relative term. The strong wash is dependent on several features, such as pH, temperature and concentration. Applicants argue that it is well recognized that a strong wash can take a number of forms, e.g., low pH, glycine wash and the like. From applicants response, and the lack of any definition in the specification the term is considered as indefinite.

B) Applicants arguments regarding the 'incomplete claim' have been considered. Applicants argue that 'methods of detecting phage internalized into cells are well known to those skill in the art.' Applicants further argue that the specification discloses the method steps. The method steps do not include whether the phage upon internalization gives out a signal or the cells are grown in certain medium such that only the cells with the internalized phage would grow. The claimed method is incomplete without the methods used for detection. Applicants arguments have been

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considered, but are not persuasive, since the method steps are essential in the claimed method, the rejection has been maintained.

16. Claims 1-7, 12-15, and 53 are rejected under 35 U.S.C. 102(b) as being anticipated by Barry et al (Nature Medicine, vol. 2, no. 3, March 1996, pages 299-305).

Barry et al teach a method to generate cell targeting ligands using peptide presenting phage libraries to select peptides that bind and enter several different cell types. The reference teaches peptide presenting phage libraries (random amino acids) fused to the amino terminus of the pIII protein. The reference teaches a method to identify the cells which bind to the phage and the selected phage or peptide sequence is determined. The reference teaches that the peptide presenting phage are useful as gene delivery vehicles. The reference teaches that the phage bearing the peptide and a luciferase (detectable product or selectable product of the instant claims 12-14) plasmid is used to mediate transfection of fibroblast cells (refers to target cells of the instant claims), and the bacteriophage is useful in gene therapy. Barry et al teach that the phage were incubated with cells for 1 hour at 4° C or 37° C, and the cells were washed 6 times with cold PBS-BSA and then the cells were incubated with 2 ml of 0.1 M HCL pH 2.2 by Glycine (refers to the strong wash of the instant claims). The cells were lysed (see page 304, right column). The reference clearly anticipates the claimed invention.

17. *Applicant's arguments regarding the rejection of claims 1-7, 12-15 and 53 over Barry et al filed on 3/31/03 have been fully considered but they are not persuasive.*

Applicants argue that Barry et al fail to disclose a method in which the phage that bound the target cell surface are removed and eliminated and therefore fails to anticipate the claimed invention.

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Applicants arguments have been considered and are not persuasive for the following reasons: a) if the phage bound to the cell surface are removed, that is all the phage bound to the cell surface are removed. In the process of internalization if all the phage which are bound to the cell surface are removed, then how are the phage internalized. That is no phage would be internalized. Does applicants phage internalize without binding to the cell surface?

B) Barry et al teach 'as a general and systematic approach for generating cell-targeting ligands for gene therapy vectors, we have used peptide-presenting phage libraries to select peptides that bind and enter several different cell types' (i.e., see the abstract). From the Barry et al teachings it is clear that the phage bind to the cell surface and then are internalized.

Barry et al further teach in page 299, right column that 'phage were initially selected that bound the PEA10 mouse fibroblast cells.' Barry et teach 'acid labile phage were eluted from cell surface. ... slightly more phage remained associated with cells following acid washes than were eluted by the acid. For the acid eluted phage none of the inserted sequences were identical' (which is interpreted as the phage does not have the peptide of interest). Barry et al further teach that phage 12.1 bound the cells approximately 100 times as efficiently. Barry et al further teach that the disclosed method not only produced much stronger cell binding peptides but also mediate endocytosis (i.e., see page 303). The reference further teaches that peptides selected to target endocytosing receptors would be most useful when linked to gene

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therapy vectors that have no inherent capacity to enter the cells. Thus, Barry et al clearly teach identifying phage which bind to the target cell surface and the peptides are internalized.

18. Claims 1-17, 51-54 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barry et al (Nature Medicine, vol. 2, no. 3, March 1996, pages 299-305) in view of either Ewijk et al (Proc. Natl. Acad. Sci. USA, vol. 94, pp 3903-3908, April 1997) or Stausbol-Gron et al (FEBS Letters, vol. 39., pages 71-75, 1996).

Barry et al teach a method to generate cell targeting ligands using peptide presenting phage libraries to select peptides that bind and enter several different cell types. The reference teaches peptide presenting phage libraries (random amino acids) fused to the amino terminus of the pIII protein. The reference teaches a method to identify the cells which bind to the phage and the selected phage or peptide sequence is determined. The reference teaches that the peptide presenting phage are useful as gene delivery vehicles. The reference teaches that the phage bearing the peptide and a luciferase (detectable product or selectable product of the instant claims) plasmid (refers to instant claim 24) is used to mediate transfection of fibroblast cells, and the bacteriophage is useful in gene therapy. Barry et al teach that the phage were incubated with cells for 1 hour at 4° C or 37° C, and the cells were washed 6 times with cold PBS-BSA and then the cells were incubated with 2 ml of 0.1 M HCL pH 2.2 by Glycine (refers to the strong wash of the instant claims). The cells were lysed (see page 304, right column).

The claimed invention differs from the prior art teachings by reciting the use of subtractive cell line. Barry et al teach method to generate cell targeting ligands and a method to identify the cells that bind to phage. Barry et al do not teach the use of subtractive strategy to eliminate non specific binding of phage members to target cells. However, either Ewijk et al or Stausbol-Gron et al teach phage display subtraction method.

Stausbol-Gron et al teach phage display subtraction method with potential for analysis of differential gene expression. The reference teaches that a competitive bio-panning procedure was developed and tested on two model systems using a phagemid library of single chain Fv antibody fragments. The reference teaches that the phage library

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was incubated with targets and competitive proteins at 4° C, and the bound phage was eluted and propagated at 37° C. The reference teaches that the subtractive panning strategy is fast and easy way to identify research reagents directed against biomarkers of cellular extracts or biological fluids. The reference teaches that the subtractive strategy is valuable in attempts to identify antibodies against known or unknown antigens in a given population of cells.

Ewijk et al teach subtractive isolation of phage-displayed single-chain antibodies to thymic stromal cells by intact thymic fragments. The reference teaches the use of phage antibody display technology with specific aim to isolate thymic stromal cell specific single chain antibodies from a phage library. A subtractive approach using intact, mildly fixed thymic fragments as target tissue and thymocytes and spleen cells used to remove undesired specificities of the phage antibody library. The reference teaches that the phage library was incubated with thymocytes and spleen cells; to this target cells (thymic fragments) have added and incubated at 4° C. The following day the supernatant was removed and the target cells were washed to remove nonspecifically adhered phages. The specifically bound phage and thymic fragments were cultured at 37° C, and the specific phage was identified. The reference teaches that the subtractive isolation using thymocytes and splenocytes as adsorber cells, and using thymic cells as target cells, they were able to isolate monoclonal phage antibodies reactive with thymic stromal cell types, while monoclonal phage antibodies to lymphoid cells were not detected.

Thus, it would have been obvious to a person of ordinary skill in the art to use the subtractive isolation of phage displayed single chain antibodies to remove nonspecifically bound members of phage library as taught by Ewijk et al or the subtraction method taught by Stausbol-Gron et al with the method of Barry et al to identify phage display members which transfer (or internalize) the specific gene to target cells, because Barry et al teach individual phage bearing the specific peptide can be isolated from the library using luciferase, the phage bearing the specific peptide is useful in gene therapy, Ewijk et al teach that the phage display technology can be applied to isolate scFvs directed to specific cell types in presence of other kinds of cells and Stausbol-Gron et al teach that the subtractive panning strategy is fast and easy way to identify research reagents directed against biomarkers of cellular extracts or biological fluids and it is valuable in attempts to identify antibodies against known or unknown antigens in a given population of cells. The person

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of ordinary skill in the art would have been motivated to use the subtractive strategy in the method of gene transfer taught by Barry et al with the expectation of eliminating non specific binding of members of phage display library with target cells.

19. *Applicant's arguments filed on 3/31/03, regarding the rejection of claims 1-17, 51-54 and 57 over Barry et al, Ewijk et al or Stausbol-Gron et al, have been fully considered but they are not persuasive.*

Applicants argue that combination of Stausbol-Gron et al or Ewijk et al with any of the primary reference would result in a screening system unsuited to the detection of internalizing polypeptides. Applicants further argue that the cited art fails to teach or suggest the use of a strong wash to remove the undesired phage and identification/selection of the remaining internalized phage. Applicants arguments have been considered but are not persuasive, because Barry et al teach the use of ^{wash} ~~was~~ at low pH (pH 2.2) (which is considered as strong wash) and Barry et al teach that the acid labile phage were eluted by acid, and the peptide presenting phage (the phage of interest) are recovered from the target molecule by using a low pH wash. Slightly more phage remained associated with the cells following multiple acid washes. The cell-associated fraction was also recovered and amplified because these phage might have higher affinities for the cells and involve hydrophobic interaction. The three or four cell-associated phage clones were identified as phage 12.1. Thus Barry et al eliminate the phage which was eluted from the target cells with acid wash at low pH.

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Applicants argue that Stausbol-Gron et al do not teach a subtractive cell line or strong wash. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See In re Keller, 642 F.2d 413, 208 U. S. P. Q. 871 (CCPA 1981); In re Merck & Co., 800 F.2d 1091, 231 U. S. P. Q. 375 (Fed. Cir. 1986). The rejection was made in combination with the teachings of Barry et al. Barry et al teach that the cells were incubated with 2 ml of 0.1 M HCL pH 2.2 by (glycine) (which refers to the strong wash of the instant claims).

Applicants argue that Stausbol-Gron et al state that strong wash can decrease the diversity of the pool by eliminating low affinity binders and teaches lower stringency is desirable. Applicants arguments are not persuasive, since Barry et al teach strong wash as in the claimed method, and Stausbol-Gron et al teach the use of subtractive cell line in analysis of gene expression. Thus, even though Stausbol-Gron et al teach lower stringency wash is desired to keep low affinity binders, it would not be teaching away, since Barry et al teach all the method steps and Strong wash to remove the unwanted binding phage.

Applicants argue Ewijk et al fail to teach the use of strong wash. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See In re Keller, 642 F.2d 413, 208 U. S. P. Q. 871 (CCPA 1981); In re Merck & Co., 800 F.2d 1091, 231 U. S. P. Q. 375 (Fed. Cir. 1986). Applicants argue that Ewijk et al use weak wash for

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phage selection. Applicants arguments are not persuasive, since Barry et al teach strong wash and Ewijk et al teachings were relied upon for the use of subtractive isolation of phage.

Applicants argue that Ewijk et al discloses a method that is essentially the opposite of the presently claimed method. 'Ewijk et al teaches the use of a weak wash to screen for binding phage and the use of a strong wash to elute and recover the desired binders, In contrast, the presently claimed method contemplates the use of a strong wash to eliminate all externally bound phage including those that specifically bind to the target cells. The remaining internalized phage are then recovered.' Applicants arguments have been considered, but are not persuasive. Applicants emphasize that in the claimed method the strong wash was used to remove or eliminate the externally bound phage including those that specifically bind to target cells. It contradicts the claimed method and eliminates all the phage, because the phage before internalizing have to bind to the target cell such that they can be internalized. Thus, as in applicants response the use of a strong wash is used to eliminate all externally bound phage including those that specifically bind to the target cells, no phage would be remaining to internalize the target cells. Thus, applicants arguments are not persuasive.

*Applicants further argue that Ewijk et al teaches away from the presently claimed invention. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 U. S. P. Q. 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 U. S. P. Q. 375 (Fed. Cir. 1986). The rejection is based*

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on combined teachings of Barry et al with Ewijk et al, and applicants arguments are based on a single reference.

Applicants argue that Barry et al teaches away from the presently claimed invention. Applicants argue that the currently amended claim clarifies that the strong wash is used to remove and eliminate phage attached to the surface of the target cells. The removed phage are thus eliminated further screening steps facilitating selection of internalizing phage. Applicants arguments have been considered but are not persuasive, since Barry et al teach the use of acid wash to remove the bound phage, and the phage remain bound to the target cells after the acid wash was considered as the phage which carry peptides and are internalized. Thus, Barry et al does not teach away from the presently claimed invention.

Applicants arguments that the cited references offer no motivation to combine. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Barry et al teach the method for identifying phage which are internalized, Stausbol-Gron et al teach phage display subtraction method; and Ewijk et al subtractive isolation of phage displayed single chain antibodies. The advantages of subtractive isolation method teachings of

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Stausbol-Gron et al or Ewijk et al are combined with the method of Barry et al in the method of identifying Internalizing phage. Thus, it would have been obvious to one skilled in the art at the time the invention was made to use the method of subtractive isolation of phage with the method of Barry et al with the expectation of reeving unwanted phage (nonspecific phage binding).

20. No claims are allowed.

21. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CAR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CAR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to P. Ponnaluri whose telephone number is (703) 305-3884. The examiner is on *Increased Flex Schedule* and can normally be reached on Monday to Friday from 7.00 AM to 3.30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Wang, can be reached on (703) 306-3217. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-4242.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0196.

P. Ponnaluri
Primary Examiner
Technology Center 1600
Art Unit 1639
10 June 2003


PADMASRI PONNALURI
PRIMARY EXAMINER